Monitoring of Satellite Thermal Plareau in Relation to Concentration of Infrared Beams out of Sea Surface Waves

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Abstract— In order to have a physical understanding of a satellite thermal plateau found on the sea surface at a satellite monitoring, a model of an infrared beam concentration at a satellite out of the water wave facet on the sea surface.

In order to have a physical understand a satellite thermal plateau found on the sea surface at a satellite monitoring, a model of an infrared beam concentration at the satellite out of water surface wave facet is introduced in this work.

A problem is on a satellite detected some beam concentrating infrared beams out of a sea surface water wave facet. Assuming that the sea surface could be taken as a black body in a scope of thermodynamics to radiate a flux of some infrared beams, a sensor of the satellite might detect an anomalous signal. The interested beam could form a caustic (or a focus) at the sensor as an effect of a specific concave wave facet on the sea water surface when each beam is radiated normal to the sea water surface. Thermodynamics tells us that a radiation follows the Stefan-Boltsmann's law, so that, the relation between an integrated intensity B of the radiation and the water surface temperature T (in Kelvin unit) is well formulated to show the following relation for a small variations of $\mathrm{d}B$ and $\mathrm{d}T$, as follows:

$$\mathrm{d}B/B = 4\mathrm{d}T/T \tag{1}$$

This relation is independent of any frequency of the interested infrared beam radiated out of the sea surface as a black body.

When beams out of the sea surface water wave facet form a focusing point at the sensor mounted on a satellite, the value of $\mathrm{d}B$ should be infinity so that the value of the $\mathrm{d}T$ is also infinity. In this case, the distance between the sensor mounted on the satellite and the wave facet is same to the altitude of the satellite above the sea surface.

When the beams form a caustic to hit the interested sensor of the satellite, and the value of $\mathrm{d}T$ is observed on a sea surface thermal pattern after a satellite monitoring, a degree of the caustic for the concentration of the infrared beams can be evaluated.

When $\mathrm{d}T = 5\,\mathrm{K}$ and $T = 273\,\mathrm{K}$, then, we have 0.018 as $\mathrm{d}T/T$. This evaluation may be a helpful result that the value 0.018 by part could be caused the existence of the wave facets which are always found on the sea water surface. Any one of the facets should be concave upward. Then, this may give us an understanding of a discrepancy on the sea surface thermal pattern with a temperature parameter after the satellite monitoring of a local sea surface thermal pattern. This may a suggesting for adjusting the thermal pattern obtained after the satellite monitoring system since the starting date of satellite monitoring. The author unfortunately such a thermodynamical understanding has never been payed for attention at the correction of the sea surface thermal pattern obtained by the satellite monitoring.

When $\mathrm{d}T = 30\,\mathrm{K}$, the evaluated value of $\mathrm{d}T/T$ is approximately 0.10989 which means the radius of the water surface curvature is near to the altitude of the satellite above the sea surface. This case is occasionally found under some conditions of the conditions related to meteorology on the interested sea surface.

For example, this case appears in the coastal zone in the northwestern Pacific. The thermal pattern of the sea surface looks like to be a thermal plateau when a distant storm in the subtropical zone is seen and the storm generated disturbances in form of the sea surface water waves are propagating out of the storm area to hit the coastal zone. This thermal plateau is found just under a foot print of a satellite with a clear sky condition. An uniformly atmospheric condition could be similar to find the storm induced sea surface waves on the apparently high temperature field taken to be as a thermal plateau. In the northwestern Pacific, the existence of the typhoon is effective.

The other case is for the cold season in the specific monsoon area. In winter of the northern hemisphere, a developing cold front of the atmosphere near the ground surface could be the most effective at finding the thermal plateau in the coastal zone in the northwestern Pacific.

With the above noted result, we should not yet take it as a convenient way for a detecting the sea surface wave field. At present, there are several factors controlling this appearance, and this problem has to be studied for a practical application to a demonstration of where the thermal plateau is appeared and of how about extent is possible to see a wave field by the satellite monitoring.

PIERS 2007 Beijing Proceedings

Published by

The Electromagnetics Academy
777 Concord Avenue, Suite 207
Cambridge, MA 02138

www.emacademy.org
www.piers.org

ISSN: 1559-9450